CHAPTER NINE

Revision and the Experience of Understanding

NOEL ENTWISTLE AND ABIGAIL ENTWISTLE

Approaches, Conceptions, and Understandings

The idea of a deep approach to learning was introdued in Chapter 1 and its meaning should have become clearer through discussions in several subsequent chapters. Its essential defining feature is the intention to understand, and that intention evokes the processes of learning which allow deep levels of understanding to be reached. The deep approach involves relating new information to prior knowledge and experience in ways which transform the information and create personal meaning. But what, exactly, is produced by these processes? What is understanding? In spite of its centrality in descriptions of approaches to learning, its meaning has been rather taken for granted. Students presumably develop conceptions or understandings of the topics they study, but how stable are they? Does their form vary, depending on the situation in which the understanding is evoked? Svensson (1989) argued that the conceptions which students held in solving physics problems were dependent on the particular problem they were examining at that time. On that basis, he expressed doubts about the stability of conceptions. In Chapter 14 we shall see that students' conceptions of learning develop as they progress through their courses, confirming that conceptions change over time. But how much do they change, and in what ways?

The most usual way of judging someone's understanding is through the way that understanding is demonstrated – what Perkins and his colleagues at Harvard have recently described as *understanding performances* (Perkins and Blythe, 1994). In exploring students' conceptions, evidence can only be derived from the expression of a conception through the explanations students give of the target concept or through their performance in solving problems related to it. On any one occasion, the explanation or performance will have elements which are specific to that particular occasion, but the understanding might also be expected to have a certain stability, in the short term, over a series of explanations or performances.

The importance of understanding in the literature on student learning, and the paucity of work looking directly at its nature, suggested that further work was required. The research reported in this chapter explores the nature of academic understanding through the experience of students. As in previous chapters, relevant data was obtained through interviews with students about a particular study task – in this instance, the intensive revision process involved in preparing for final examinations.

Interviews on Revision Strategies

In traditional degree courses in Britain, substantial weight is still put on final

examinations in determining the class of degree to be awarded. In the final year, teaching usually finishes before the Easter vacation, leaving students with up to ten weeks in which to prepare for some six three-hour essay examinations intended to test their conceptual understanding of each course. For the purposes of this investigation, this context was ideal to explore students' experiences of developing conceptual understanding and of explaining their understandings in the examinations.

The empirical analyses presented here are derived mainly from an interview study of eleven final year students, nine of whom were taking final examinations in psychology. Two of these psychologists were taking a year out of medicine, while two additional students included in the sample were studying zoology. The analyses of these data have been supplemented by the written comments of a further eleven final year psychologists, and by a preliminary analysis of interviews with fifteen students taking social and economic history.

Interviews were based on a set of broad issues which were arranged in a logical progression, starting from past experiences of revision and leading up to revision for Finals. The interviews concentrated mainly on concrete events and strategies during revision, but all the students were also asked about feelings and experiences connected with the development of understanding. Interviews were tape recorded and transcribed in full. The qualitative analyses carried out on the data were of two kinds. First, all aspects of the phenomenon experienced by the respondents were identified. While logic is used in separating out these aspects into a coherent pattern, no relationships between the categories are necessarily expected. The other form of analysis was essentially phenomenographic, with logical relationships between the categories being fully explored (see Marton,1994).

Here, four separate analyses are summarised: the revision strategies adopted by students (for additional details, see Entwistle, N. and Entwistle, 1991); the nature of academic understanding as generally experienced by the students (Entwistle, A. and Entwistle, 1992); differences between students in their *forms of understanding* (Entwistle, N. and Entwistle, 1991); and, finally, the way students had experienced the understandings as quasi-sensory *knowledge objects* (Entwistle and Marton, 1994; Entwistle, 1995).

Revision Strategies

The interviews all began by asking about revision strategies – how students had revised in the past and how their strategies had changed during the degree course. This initial focus was deliberately 'concrete', allowing students to describe their actual study behaviour before asking them to consider less tangible aspects of their experience.

Students described revision strategies which had certain elements in common, although they differed considerably in the extent to which these strategies were used. Essentially, students had accumulated during each course sets of notes and reports from lectures, from books and articles, and also from projects and practical work. Of course, the volume of notes each student had produced varied considerably, depending on the amount of independent reading undertaken. Even so, all students in their final year were faced with such a substantial pile of material

that most of them tried to make sense of it through condensation into revision notes. The volume of notes was progressively reduced, step by step, often finishing with a single sheet of notes for each topic. This final condensed revision sheet usually contained a set of headings and very brief indications of related ideas, and was used as a mnemonic through which to retain more detailed information. Some students organised the main headings on this sheet in the form of a patterned note or concept map, the structure of which was more easily remembered in the examination.

Students reported that they revised in a succession of phases. Realising that understanding was required, they started their revision by trying to make sense their notes as a whole, reading them through several times. The process of 'concising' then began and summary notes were usually written at each stage of revision. Understandings were rehearsed, either by talking the ideas through with other students, or by constructing explanations for themselves on paper or out loud. Once understandings were established, students became more strategic, although to varying degrees. They looked at previous examination papers and began to consider the amount of information needed and also to think how best to structure typical answers. Finally, students rote learned the details necessary to support their explanations in the exams, and the summary sheets were used to see to what extent the structure of answers and the supportive details could be remembered. As one student said:

> I designed a sort of check-list system which I used to cross off what I knew ... going from many to few. ... Basically it went from going through the whole lot of notes ... and making condensed notes. (Then as I went through those) I would ask myself if I remembered (each bit), and if I could (explain) it, then that went off the list... Under (various) headings I would have the important points which showed the understanding,...(although) it was basically names, experiments and important examples, which triggered off the understanding by reading it through.

The Nature of Academic Understanding

The analysis, so far, has been derived from students' comments on their revision strategies. The next section of the interview moved on to the students' experiences of understanding – how they knew when something was understood, what it felt like when they did not understand, and what they did to develop their understanding further.

In the interviews, students tended to describe similar components within their experiences of reaching understanding. There was a *feeling of satisfaction*, although that feeling varied in its expression from the sudden 'aha', as confusion on a particular topic was replaced by insight, to a less dramatic feeling associated either with being able to follow a lecture or with an emerging appreciation of the nature of the discipline itself. This feeling was derived from a recognition of the *meaning and significance* of the material learned. The feeling of understanding also included a recognition of *coherence and connectedness*. The idea of 'things clicking into place' or 'locking into a pattern' was frequently mentioned, and this conveyed an implication of completeness. However, students often commented

that their understanding might well develop further, which seemed to imply *provisional wholeness.* The students seemed to be experiencing 'closure' – feeling that the current understanding was satisfactory – and yet also anticipating from their previous experience that their current understanding might well be adapted and extended in the future. This almost paradoxical combination of completeness and potential for further development does seem to be an important aspect of the concept of understanding which contributes to it being both stable and changeable.

Associated with wholeness, was a recognition of the *irreversibility* of the understanding achieved – at least once it had been thoroughly established. The feeling of coherence and connectness led students to express *confidence about explaining* – a belief that they could provide a convincing explanation of what they had come to understand, either to themselves or to others. They also recognised that understanding provided them with *flexibility in adapting and applying* ideas and information effectively. It was this confidence, both in being able to provide a convincing explanation and in adapting ideas flexibly for use in varying and novel contexts, which distinguished 'understanding' from 'knowledge' in the students' descriptions.

Bringing together typical comments from several students, the following composite description of the experience of understanding can be presented.

> Understanding is the interconnection of lots of disparate things,... the feeling that you understand how the whole thing is connected up – you can make sense of it internally... If I don't understand, it's just everything floating about and you can't quite get everything into place – like jigsaw pieces, you know, suddenly connect and you can see the whole picture... But there is always the feeling you can add more and more and more... (Really understanding), well, for me, it's when I ... could explain it so that I felt satisfied with the explanation... (When you understand like that)... you can't not understand it (afterwards). You can't 'de-understand' it!

Individual Forms of Understanding

While the experience of understanding seemed to be described in similar ways by most students, there were marked differences in the *forms of understanding* which students sought. These forms of understanding appeared to differ in the three main ways – *breadth, depth,* and various types of *structure* – summarised in Table 9.1 below.

The idea of breadth of understanding was made explicit in the following comments:

> I think there is more than one type of understanding – understanding of a specific paper or point or experiment, and then a further understanding of how these relate within the whole topic.

> It's a nice feeling when everything begins to click into a wider picture and you can see, like Art History clicks into History, which clicks into Anthropology, and what was happening in Psychology, and the whole thing across the board... It's all coming together and you can locate things on the picture.

TABLE 9.1
Individual Forms of Understanding

Breadth of understanding
Depth or level of understanding
Structure used to organise the material being learned
1. little or no structure being imposed on the facts learned
2. relying exclusively on the lecturer's structures
3. producing prepared answers to previous years' questions
4. adapting own understanding to expected question types
5. relying on an individual conception of the topic

'Breadth' described the amount of material which students sought to integrate during revision. This breadth depended partly on the extent of additional reading carried out during the course, and partly on the willingness to look for connections across more than one topic or course. Students also recognised that understanding could be developed to different levels, which can be seen as variations in the 'depth' of understanding. Initial understanding was successively deepened from the initial understanding by actively seeking links between ideas.

> When you're coming up to Finals (you ask) - "Do I really understand it ? "... I think your understanding increases gradually on each topic. You think you understand something (in first year), but you don't really understand it until you really understand the whole subject. There's never a moment of (total) enlightenment. As you gradually build up knowledge, the understanding comes with it.

Finally, individual forms of understanding differed in terms of how the understanding was structured. A hierarchy could be detected in the different types of structure identified among the students' contrasting descriptions of their revision. At the lowest level of the hierarchy there was little or no structure, with the students seeking to understand only the content of the notes, so as to obtain the information they would then rote learn. This category was found only in the comments of the two students taking psychology as an interlude in their medical studies. They were describing, not Finals, but the way they had revised for their pre-clinical examinations. As one of them said:

> One thing I do is, at the beginning of every course, I read the past papers on the day I start the course, and ... get orientated towards the exams. I don't like to waste my time... Well, medicine is different, I think, from other subjects... The facts ... you just have to learn them... Sometimes, I would ... get up at 5 am and read a few subjects the morning before and use (that,

> and pass)... But then I would forget it very quickly after the exam, which isn't much good for the patients in the future...

The second category of understanding was in some ways particularly worrying. Students had simply adapted the structure provided by the lecturer and were seeking to reproduce it in the exam answer. It was worrying because the answer might appear to represent thorough, well-structured understanding, and yet that understanding derived wholly from the lecturer, not the student. There was, of course, a sense in which the student had understood the topic, but it represented a narrow and rather inflexible form of understanding – understanding at a surface level, as it were. Students with this form of understanding seemed to have difficulty in explaining what they had understood. They tended to rely on paraphrasing their notes, and looked out for questions in the exam which allowed them to do just that.

> Some questions are basically asking you to discuss (a topic), and if that comes up, it's just remembering my lecture notes and putting down what they said.

> Sometimes I was lucky, when the question said (in) effect " Re-write your mind map in prose". (Well) the mind maps were, to a large extent, based on past exam questions. ... But other times I had to make connections which weren't there in the first place, by extending them (as I went)... By and large, those were worse essays than ... I would have written, had the question been more favourable.

In the remaining three categories, the students had all made some effort to reorganise their revision notes so as to understand the material for themselves. They differed mainly in the breadth and depth of the understanding they had sought, and the extent to which they were being strategic – gearing their learning directly to the form and content of the examination questions they anticipated from looking at previous papers. In the third category, students revised mainly by writing out answers, or structures for answers, to specific questions or question types, showing little evidence of wide independent reading during the course. In the fourth category, the independent reading and thinking was much more extensive, and the initial studying seemed to have developed structures which implied a thorough, personal understanding of the material. In the revision process, these students were quite strategic, relating their revision notes to anticipated question types and thinking about the time constraints in the examination.

> The main thing that I really relied on during revision ... involved going through all the past papers and identifying all the questions on certain topics (the ones I had chosen to revise) and doing short essay plans for each question I had found on that topic.

> The more I have done exams, the more I'd liken them to a performance, like being on a stage; ... having not so much to present the fact that you know a vast amount, but having to perform well with what you do know. ... Sort of, playing to the gallery. ... I was very conscious of being outside what I was writing.

Students in the final category had also read widely and developed their own structures of understanding, but were less strategic in revision. Their focus seemed to be directed towards developing an effective and independent understanding of the discipline as a whole, within which the structure of individual answers could be subsumed. However, this strategy sometimes led to problems in the examinations. As one student commented:

> Well, there were cases where I knew too much... I had to go through all the stages of working through (the topic) and showing that I had understood it. I couldn't gloss over the surface. And once I started writing, it all just 'welled up'. I felt that I couldn't interrupt the argument half-way as it was developing... Half an understanding doesn't make sense!... It's essential to demonstrate your understanding of the whole, and its implications and limitations... You could say I shouldn't be (doing) that in an exam, but basically I have to do it that way, because that's me. Gearing your learning too closely just to previous exam papers seems a bit like a form of cheating.

In preparing for Finals, all the students had to be strategic, to some extent. Yet, there were marked differences in the balance between focusing on the academic content and on the assessment procedure. In lectures, the strategic approach involves a conscious awareness of two focuses of attention – the content of the lecture and what the lecturer considered to be important. In an earlier study at Edinburgh, a politics student had stated:

> I play the examination game. The examiners play it too. ... The technique involves knowing what is going to be in the exam and how it's going to be marked. You can acquire these techniques from sitting in the lecturer's class, getting ideas from his point of view, the form of the notes, and the books he has written – and this is separate to picking up the actual work content. (Miller and Parlett,1974)

This same divided attention was also found during revision – between understanding the content and preparing to answer questions – and the balance and tension between these affected the form of understanding the students sought and reached.

Experiencing the Structure of Understanding

The final analysis was carried out jointly with Ference Marton. The form of that analysis was triggered by one particular extract and led to a reanalysis which concentrated on the experiences of the understandings themselves, rather than on the processes preceding them (Entwistle and Marton, 1994). This extract came from a student who was able to reflect particularly clearly on how she used the structures in her revision notes and brought them to mind on demand within the examination.

> (From my experience) there's no differentiation between things that have been learnt visually, mechanically, or (through hearing); they feel exactly the same... (In exams), I just clear my mind and something comes... You know

> it's visual in some ways, but it's also just there without necessarily being visual... (It's not as if) you remember a page, and the page is locked in your memory. What I'm saying is that the ideas are locked in your memory and they display as a page when you're thinking about it, but not necessarily when you're putting it down... I think, in a stress situation like an examination, you don't actually (have to) reach for it, it comes out automatically. That may show that it's not actually a visual memory as such, but a visual expression of 'central memory'.

The subsequent analysis of the whole set of interviews suggested that this experience was not uncommon, although the majority of students found difficulty in articulating it. The experience was related to the way in which revision had been carried out. As we have already seen, students seek to understand their notes first, and subsequently rote learn details needed for examination purposes. During the exam, students relied on recalling the structure of their understanding; concentrating on that structure then 'pulled in' the details as they were needed. In the words of one student, describing his ability to visualise a diagram he had been revising:

> I can see that virtually as a picture, and I can review it, and bring in more facts about each part... Looking at a particular part of the diagram sort of triggers off other thoughts. I find schematics, in flow diagrams and the like, very useful because a schematic acts a bit like a syllabus; it tells you what you should know, without actually telling you what it is. I think the facts are stored separately, ... and the schematic is like an index, I suppose.

Piecing together the range of incomplete descriptions, we concluded that students were experiencing their understandings as having some internal form and structure – almost as independent entities which came to control their thinking paths (Entwistle and Marton, 1994). The term *knowledge object* was used to describe the essence of these experiences. Its defining features involve an awareness of a tightly integrated body of knowledge, the ability to visualise the structure in a 'quasi-sensory' way, an awareness of unfocused aspects of knowledge, and recognition of its use in controlling explanations during the exams (Entwistle, 1995).

The control of explanations through the knowledge object can be seen in the following extract.

> This (way of revising) gave you quite a broad base from which to answer any question that came up on that topic, so you were used to being flexible in the way that you answered the question – it allowed you to adapt to different ways in which the question could be worded, and it also organised in your mind the relationships between different aspects of, and approaches to, a question.

Another student talked about her knowledge object in ways which seemed to give it an almost independent existence, as it was used to monitor the adequacy of the developing explanation.

> Following that logic through, it pulls in pictures and facts as it needs them... Each time I describe (a particular topic), it's likely to be different... Well, you start with evolution, say,... and suddenly you know where you're going next. Then, you might have a choice ... to go in that direction or that direction... and follow it through various options it's offering... Hopefully, you'll make the right choice, and so this goes to this, goes to this – and you've explained it to the level you've got to. Then, it says "Okay, you can go on to talk about further criticisms in the time you've got left".

The knowledge object is used to provide flexible control of an examination answer as it develops. There is a dynamic interplay between the knowledge object and the demands of the question and this produces an essentially unique answer. However, the knowledge object also seems to produce a generic structure for a topic which is likely to remain consistent, and would presumably lead to recognisable similarities in the way the topic is explained on different occasions. This conclusion might explain the suggestion made earlier that conceptions or understandings are to some extent stable, and yet the expression of those conceptions must necessarily depend on the specific context and on the particular problem set.

The introduction of the term 'knowledge object' has provoked a variety of reactions. Some people accept the concept as describing a 'recognisable reality', but others have challenged the use of the term 'object', its generality, and its stability. 'Object' might suggest blocks of knowledge, but in our work the term is <u>not</u> intended to suggest that knowledge is a commodity which can be transferred from teacher to student. Far from it. The knowledge object is essentially a personal construction providing a memorable framework which holds together and summarises complex interconnections created in the process of developing conceptual understanding.

Doubts about the general value of the term stem from its link to the intensive revision demanded for Finals. What happens in everyday studying? In a more recent study, students have been asked about how they research coursework essays (term papers). Our preliminary conclusion is that the knowledge objects formed in essay writing are much less firmly established than through extensive revision, and occur only when the students engage actively and personally with the topic (Entwistle,1995a). In coursework, students probably have to be far too strategic in their approaches to essay writing and time management for personal engagement to occur on a regular basis

Other recent evidence about the existence of knowledge objects is anecdotal. It appears that part of the process of preparing a formal presentation or lecture may involve the production of a knowledge object which is then used to control the structure of the explanations provided to the audience. And there is evidence from one student that a knowledge object, created during revision five years previously, could be recalled and used to remember the structure of an explanation (Entwistle,in press). In this instance, the knowledge object involved enduring visual images and these had been accidentally triggered in a specific task. This experience invites further consideration of the role of metaphor and imagery in teaching and learning.

Implications for Education

There has been increasing criticism of the use of formal examinations in higher education. Some of the experiences of the students interviewed in this study add to these criticisms by highlighting negative effects on learning, and showing how the format of many examinations may induce superficial forms of understanding. But where individual forms of understanding have been actively sought, they suggest the importance of providing opportunities for bodies of knowledge to be integrated into personally meaningful, and enduring, patterns of understanding.

The negative experiences were mentioned by several students who resented a distortion of their learning activities. They distinguished sharply between the understanding which they sought initially in their studying and the learning they had to do afterwards to cope with the examinations. The comments of two of the students illustrate this point well.

> After I'd been reading all the books for three or four weeks, ... I understood things perfectly well... But I knew that understanding wouldn't help me in the exam. When you're under pressure, you've got to remember things quickly and get the facts down... I could discuss books with people, but if it actually came to an exam and writing an essay, I would have been hopeless. So, I took my lecture notes and actually memorised them, not verbatim, but memorised the themes and the questions brought up.

> The problem at university is that there is just this immense pressure to learn everything, because you're going to have to do exams at the end of the year... I'm quite resentful in a way, ... because I feel I understand so much more than I can put down in exams... You've got to learn this for exams, so you're always trying to structure it in a way that you know you're going to have to write in this essay question... It's an immense release, now that I've finished university, to know that I can read books without having to learn them, because there's definitely a different way of reading them if you just read it for messages and understanding, whereas for part of the course it's learning it.

Most students had recognised that they would have to fit their answers into a restricted time period, while others had also tailored the form of their understanding to the type of examination questions anticipated. Where the questions were more demanding – requiring individual answers or solutions to problems – students realised that they would need a more flexible structure to respond to the specific question set. Such a flexible approach was easier to achieve where understanding had been developed within a personal structure, particularly if it followed the fundamental principles of the discipline. Moreover, open questions elicit answers which allow conceptual understanding to be assessed with more confidence.

There is already convincing evidence that the general approach to studying can be affected by examination format, with fact-orientated multiple-choice or short-answer questions encouraging surface approaches and essay questions evoking deep approaches (Thomas and Bain, 1984). However, this present study

indicates that essay questions also differ in their effects on revising. Narrowly technical questions, or those closely aligned to the taught course, allow weaknesses in understanding to be disguised – the crucial connections on which understanding rests will not have been tested.

Thus, degree examinations at apparently the same level may be making very different intellectual demands on students. What external examiners may judge to be conceptual understanding, may be no more than a close match between the content of the lecture course and narrowly based examination questions. The nature and format of assessment procedures will affect their level of difficulty, creating formidable difficulties in making convincing comparisons between standards.

The present small scale study can do no more than draw attention to the possible effects of questions of different kinds, but it does seem to be an important area for future work. More research is also required into the ways in which understanding is demonstrated – either through applying knowledge within novel contexts or through providing convincing individual explanations. And, to make progress in this direction, the nature of understanding across a variety of topics, disciplines, and professional areas would have to be systematically explored.